Force Description

Forces are what we use to describe the interactions that occur between objects. The net result of the interactions that an object experiences, (i.e. the net force acting on the object), will determine the motion of that object. All of this is then brought together by Newton's 2^{nd} Law.

Force Notation

We will use the following notation when working with forces:

$\vec{F}^{\text{type}}_{\text{agent on object}}$

An example is the following: $\vec{F}^{g}_{E1}$, which is read as, "the force of gravity from the earth acting on object 1".

Force Inventory

Force Type	Symbol	Magnitude	Comments	Interaction†
gravity (NC)*	$\vec{F}^{g}$	$m\,g$	Force of gravity near surface of planet.	Gravity
Normal (C)**	$\vec{F}^{N}$	derived		EM‡
Tension (C)	$\vec{F}^{T}$	derived		EM
Friction	$\vec{F}^{f_k}$	$\mu_k\lvert\vec{F}^{N}\rvert$		EM
Friction	$\vec{F}^{f_s}$	$\leq \mu_s\lvert\vec{F}^{N}\rvert$		EM
	$\vec{F}^{f_{s,max}}$	$\mu_s\lvert\vec{F}^{N}\rvert$		EM
Generic	$\vec{F}^{P}$	depends	Used to describe general interactions	depends
"Push / Applied"	$\vec{F}^{A}$		Any of the other forces in this list.	
Spring (C)	$\vec{F}^{S}$	$k\,\lvert\Delta x\rvert$		EM
Thrust (C)	$\vec{F}^{Th}$	depends		EM
Wind (C)	$\vec{F}^{W}$	depends		EM
Lift (C)	$\vec{F}^{L}$	depends		EM
Drag (C)	$\vec{F}^{D}$	$\propto \lvert\vec{v}\rvert^2$		EM
		$\propto \lvert\vec{v}\rvert$		
Gravity	$\vec{F}^{G}$	$\frac{Gm_1m_2}{\lvert\Delta\vec{r}_{12}\rvert^2}$	Universal law of gravity; far from surface	Gravity
Buoyant (C)	$\vec{F}^{B}$	$\rho\,V_d\,g$		EM
Electric (NC)	$\vec{F}^{E}$	$\frac{k\lvert q_1\rvert\lvert q_2\rvert}{\lvert\Delta\vec{r}_{12}\rvert^2}$		EM
Magnetic (NC)	$\vec{F}^{M}$	$\lvert q\rvert\lvert\vec{v}\rvert\lvert\vec{B}\rvert cos\,(\theta)$		EM
Electromagnetic (NC)	$\vec{F}^{EM}$	$\left\lvert q\left(\vec{E}+\vec{v}\times\vec{B}\right)\right\rvert$		EM
Nuclear Strong (NC)	$\vec{F}^{NS}$			NS
Nuclear Weak (NC)	$\vec{F}^{NW}$			NW

* Non-contact.

** Contact.

† All interactions are non-contact (NC).

‡ Electromagnetic interaction.